Center Plan

for LaRC

Software Process Improvement

August 2001

Developed by the

LaRC Software Engineering Process Group

under the Direction of the

LaRC Software Management Steering Group

Approved by

LaRC Center Director _____

Revision Record

Issue Date	Description of Revision (Include reason for change if not self-evident.)	Section Affected	Prepared By	Authorized By

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1. Introduction

Software engineering[1] is a key enabling technology necessary for the support of NASA's Enterprises. Ensuring the quality, safety, and reliability of NASA software is of paramount importance in achieving mission success. Through surveys and assessments, many software challenges within the Agency have been identified and documented. In response to the concerns about NASA's ability to effectively manage the expected continual exponential growth in the scope, complexity, and importance of software within its systems, the Administrator requested the creation of the NASA Software Initiative.[2]

That Initiative defines a NASA-wide, comprehensive approach to improve software quality, safety, and reliability by improving software engineering to a quantifiable maturity level, commensurate with mission criticality, to meet the software challenges of NASA. The Goal of the NASA Software Initiative Implementation Plan is to "Advance software engineering practices to effectively meet the scientific and technological objectives of NASA." The four strategies for achieving the goal are:

1. *Implement a continuous software process and product improvement program across NASA and its contract community.*
2. *Improve safety, reliability, and quality of software through the integration of sound software engineering principles and standards.*
3. *Improve software engineering practices through research.*
4. *Attract and retain software engineers and improve their knowledge and skills.*

This Center Plan for Software Process Improvement (SPI) specifies how the NASA Software Initiative Implementation Plan will be implemented at the Langley Research Center (LaRC). This Center Plan focuses on Agency Strategy 1 as LaRC's primary strategy; LaRC's role in Agency Strategies 2 through 4 is to support those Agency activities. Section 5 outlines the LaRC strategies and objectives and their alignment with the Agency strategies and objectives. The goals of this Center Plan are not only to improve the quality, safety, and reliability of software developed for or by LaRC, but also to increase the productivity of the developers, and to increase customer satisfaction with LaRC software products. The Plan is largely based on the Capability Maturity Model–Integrated (CMMI^{SM}) method formulated by the Software Engineering Institute (SEI) of Carnegie Mellon University and proven in practice. To achieve the goal of this Plan and Strategy 1 of the NASA Software Initiative Implementation Plan, LaRC will use the CMMI to ultimately achieve a Level 3 rating for selected organizations and will perform additional SPI-related activities with the software developers, managers, and assurance engineers at LaRC. The CMMI will be used for organizations that are responsible for overall software project management, development, and assurance; both CMMI and the Software Acquisition CMM® (SA-CMM®) will be used when the software is assigned to a contractor. Appendix A provides an overview of CMMI and SA-CMM. These models will be used as benchmarks against which to evaluate LaRC's current practices and identify its software engineering deficiencies. Activities

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[1] For the purposes of this Plan only, the term 'software engineering' refers to software development, assurance, and management. Other definitions of terms used in this document can be found in appendix B.

[2] Reference the "NASA Initiative for Software Safety and Quality" presented by Lee Holcomb to the NASA Senior Management Council, April 12, 2000 for information on this Initiative and the specific rationale for the Initiative.

performed under this Plan are intended to eliminate identified deficiencies by putting in place piloted and proven processes, techniques, and tools.

The SEI recommended approach to implementing CMMs is to form a software Management Steering Group (MSG) to oversee the improvement activities and a Software Engineering Process Group (SEPG) to lead their implementation. Both groups have been in place at LaRC for over two years; their specific roles are described further in Section 4. The SEPG, under the direction of the software MSG, has developed this Plan to describe the software engineering process improvement goals, strategies, approaches, and tasks for the Center. The organization of this Plan follows the outline and required content specified in appendix C of the NASA Software Initiative Implementation Plan.

2. Goal

The goals of this Plan are to improve the quality, safety, and reliability of software developed for or by LaRC, to increase the productivity of the developers, and to increase customer satisfaction with LaRC software products. This will be accomplished by implementing software engineering process improvements for mission-critical and research software development activities at the Center. This document provides a detailed plan with strategies and measurable objectives for meeting the above goal.

3. Scope

This Plan addresses SPI for software development that supports Center research and for mission-critical software development. This Plan is to be used by the MSG and SEPG at LaRC, by selected organizations involved in software, and by selected "project partners" within those organizations. The selected organizations which have primary roles and responsibilities in the CMMI and SA-CMM based improvement during the first year of this Plan are the Sensor Systems Branch (Systems Engineering Competency), the Systems Development Branch (Airborne Systems Competency), and the Office of Procurement.

The Center will introduce CMM-based improvements (i.e., CMMI and SA-CMM) in phases, beginning with an initially selected organization. After the implementers gain experience with the initial organization, CMM-based improvements will be performed in the remaining organizations selected by the MSG. The bulk of this Plan addresses CMM-based improvements for those selected organizations. The organizations will be internally assessed against the CMM to determine their current baseline. Deficiencies will be identified, best practices will be documented and refined, and improvement activities will be performed to eliminate identified deficiencies. When the best practices have been shown to be successfully repeated across multiple projects and all identified deficiencies for the applicable CMM level have been eliminated, an assessment will be performed by an authorized lead appraiser to obtain a CMM level rating.

Parallel with the above CMM-based improvements, additional SPI activities for the overall LaRC software developers, managers, and quality engineers will be performed. These include identifying and piloting industry best practices to increase productivity and quality (e.g., the SEI

Personal Software Process), identifying and utilizing labor saving tools, and mentoring projects on using these new technologies.

4. Ownership of the Plan

The activities documented in this Plan are managed and monitored by the SEPG, under the direction of the software MSG in accordance with their charters (see Langley Policy Directive 1150.2). The membership and list of organizations represented on the MSG and SEPG are defined in the charters. The NASA Software Initiative Implementation Plan requires the naming of a "software champion" for the Center, and the Leader of the SEPG is hereby so designated. The SEPG is responsible for the content of the Plan and for recording and tracking individual commitments that are made and planned versus actual progress in execution of this Plan. The SEPG will also name a Configuration Manager, who will be responsible for the ongoing maintenance and version control of this Plan. The MSG is responsible for providing Plan direction, approving the Plan, and for supporting its implementation. Figure 4-1 shows the LaRC SPI organizational structure and its relationship to other NASA Software Initiative organizations (Office of the Chief Engineer (OCE) and the Software Working Group (SWG)).
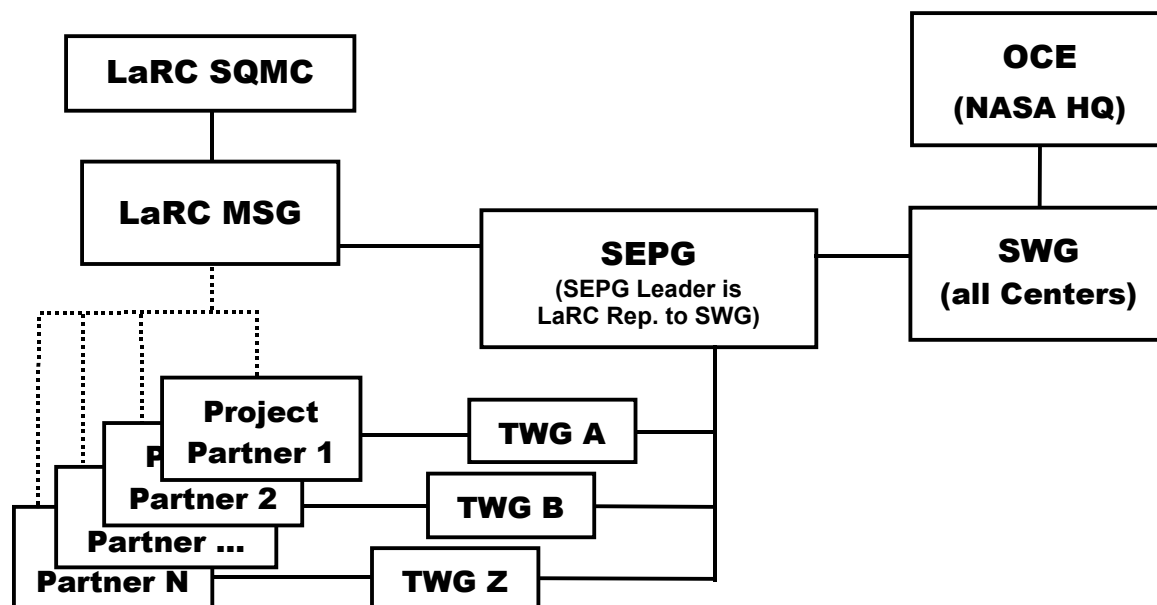

Figure 4-1. LaRC Software Process Initiative organizational structure.

The SEPG will conduct a monthly status meeting to update the Center Plan schedule with actual progress evaluated against planned progress and to review the planned activities. Support contractors will participate in the monthly SEPG status meetings and will provide monthly cost, hour, and task reports as required. The SEPG will establish short duration Technical Working Groups (TWGs) to document best practices and define procedures to eliminate deficiencies; these procedures are then piloted with project partners. The TWGs will also provide monthly status reports at SEPG meetings. The SEPG will follow the risk management process documented in appendix C. The SEPG will take corrective actions on both in-house and

contracted activities to mitigate risks, or whenever actual progress deviates significantly from planned progress. Changes in commitments will be agreed upon by all concerned. The SEPG will review the status of the Plan quarterly with the MSG and semi-annually with LaRC senior management in a manner determined by the Strategic and Quality Management Council (SQMC). This Plan will be reviewed and updated annually to reflect necessary changes and lessons learned in implementing software process improvement at LaRC, and to document detailed activities for follow-on years.

The following information will be used to report progress to the OCE:
- Annual status reports will document progress made against the major Work Breakdown Structure (WBS) milestones and the NASA Software Initiative Improvement Plan goal; these status reports will include a discussion of schedule planned versus actual activities, deliverables, and associated lessons learned.
- Results of assessments against the CMMI and SA-CMM will be documented and included in the annual report.
- NASA Software Metrics, as defined in NPG 2820, will be submitted periodically.

5. LaRC Software Process Improvement Strategies and Objectives

This section provides the strategies, objectives, and approaches that LaRC will employ to achieve its SPI goal. The LaRC strategies map directly to and support fully the implementation of the NASA Software Initiative Implementation Plan strategies listed in the Introduction.

LaRC's primary strategy focuses on achieving the objectives of Agency Strategy 1. In LaRC's Strategy 1, the objectives are based on the SEI's IDEAL[3] model phases, which are commonly used as a roadmap for implementing capability maturity models. An overview of the IDEAL model can be found in appendix D. The SEI has defined generic activities that should be performed to implement the IDEAL model, particularly its last three phases. These activities form the Process Change Method (PCM), which is outlined in Figure 5-1. The objectives under LaRC's Strategy 1 implement the PCM.

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[3] IDEAL, representing the Initiating, Diagnosing, Establishing, Acting, and Learning phases of SPI, is a service mark of Carnegie Mellon University. See http://sei.cmu.edu

1. **Organize and Prepare**
   - Form the SEPG
   - Educate and train the SEPG
   - Establish SEPG processes
   - Set up the SPI library and SPI repository
   - Develop the SEPG Action Plan
   - Communicate the Plan

2. **Conduct Organizational Scan**
   - Define and understand the process requirements
   - Plan and prepare for the scan
   - Gather the organizational data
   - Evaluate the organizational data
   - Identify high-leverage opportunities
   - Identify project partners
   - Plan TWG deployment strategy
   - Communicate and obtain buy-in

3. **Establish Technical Working Groups**
   - Establish criteria for team membership
   - Select team members
   - Charter the team
   - Train the TWG(s)
   - Define team objectives and roles
   - Develop TWG improvement plan
   - Communicate the plan

4. **Understand Project's Current State**
   - Conduct collaborative planning with project partner
   - Conduct process data-gathering
   - Develop an existing process description
   - Obtain feedback and refine process description
   - Communicate results

5. **Redesign the Process**
   - Perform CMM-based gap analysis
   - Identify other improvement opportunities
   - Develop the technical design of the new process
   - Conduct impact and risk analysis
   - Communicate the vision

6. **Develop Whole Solution**
   - Identify solution components
   - Conduct research
   - Plan the development of solution components (guides, training, etc.)
   - Communicate the plan
   - Develop or tailor the solution components
   - Establish process asset library

7. **Conduct Pilots and Evaluate**
   - Develop pilot implementation plan
   - Train project in performing new process
   - Support and monitor pilot project
   - Evaluate pilot results and improve
   - Communicate results and update library

8. **Facilitate Organizational Learning**
   - Select target project(s) and plan
   - Tailor process assets
   - Support and monitor project(s)
   - Conduct ongoing evaluations and identify new improvement opportunities
   - Conduct improvement activities
   - Communicate results and update the process asset library

Figure 5-1. Outline of SEI's *Process Change Method*

The LaRC WBS is summarized below; the detailed WBS and the schedule for implementation will be updated at the SEPG monthly status meeting and posted to the Web site <http://sw-eng.larc.nasa.gov/center_plan/schedule.cfm>. The detailed WBS also specifies the individuals responsible for implementing each element.

Strategy 1: Implement a continuous improvement program for software processes and products across NASA LaRC and among its support contractors. Use CMMI and SA-CMM along with other successful improvement models to provide a framework for SPI, particularly for organizations that develop complex or mission-critical software.

Objective 1. Establish the Center's commitment and direction for meeting the NASA Software Initiative Implementation Plan's goal through the development, approval, and implementation of the supporting Center Plan for LaRC Software Process Improvement.
- Organize and plan LaRC SPI activities (include responsibility for the success of LaRC SPI Plan as an element in the performance plan of the Associate Director for R&T Competencies)
- Communicate SPI activities to management and LaRC software community
- Analyze metrics collected through the Langley Management System (LMS) software procedures and use as basis for improvement
- Perform management tracking and oversight of SPI activities

Objective 2. Determine the current level of software development capability relative to the CMM for selected organizations and identify existing best practices for use in SPI activities. Target improvement opportunities based on priority, resources, and expected benefits.
- Assess the current capability for selected organizations
- Identify and prioritize improvement opportunities
- Plan deployment of TWGs

Objective 3. Work with project partners to understand, define, and modify existing *project* processes. Bring project partners up to CMM Level 2.
- Establish the TWG
- Document the existing *project* process
- Modify the process as required
- Conduct pilot(s) and evaluate the results
- Deploy the process to other project partners within the selected organization
- Conduct Level 2 assessment of selected organization

Objective 4. Work toward development of *standard* software processes for the selected organizations and work to bring them up to CMM Level 3
- Modify LMS software procedures to improve software processes and to conform newly released NASA Policy Directives (NPD) and NASA Policy Guides (NPG)
- Establish the TWG
- Develop *standard* software process for the selected organization from *project* processes within that organization
- Conduct pilot(s) and evaluate results
- Deploy *standard* process to other project partners within the selected organization
- Conduct Level 3 assessment of selected organization

- Encourage external partner compliance with CMM Level 3

Note that in Strategies 2 through 4, LaRC's role is to support the corresponding NASA Software Initiative Implementation Plan strategies. Examples of support include participating in subgroups to update NASA policies and guidelines, and coordinating LaRC seminars to infuse new methods or techniques into local software development activities. The implementation details and specific responsibilities for support of those strategies are defined in that Agency-level Plan.

Strategy 2: LaRC will support the Agency strategy to improve safety, reliability and quality of software products through the integration of sound software engineering principles and standards.

Strategy 3: LaRC will support the Agency strategy to improve software engineering practices through research.

Strategy 4: LaRC will support the Agency efforts to attract and retain software engineers and improve their knowledge and skills.

6. Schedule

Figure 6-1 shows a high-level schedule of the activities to be performed under this Plan for the first fiscal year.

The detailed WBS, deliverables, and schedule for the strategies, objectives, and approaches to implement this Plan are in a separate document (LaRC_SPI_Plan_r#v#.mpp, where r# is the release number and v# is the version number). After initial CMM assessments are performed, the detailed schedule will be refined to reflect the knowledge of weaknesses to be eliminated and the associated schedule and resources required. Changes that affect the detailed schedule require approval by the MSG; changes that affect the budget require approval by the SQMC. As the detailed WBS document is updated annually for resubmission to the OCE, the schedule for specific activities in the subsequent fiscal year will be baselined.

Activity	FY2002			
	Qtr. 1	Qtr. 2	Qtr. 3	Qtr. 4
Put in place SEPG management processes (e.g., tracking and oversight, configuration management, risk management)	▬			
Conduct internal CMMI assessment of Organization 1	▬			
Prioritize / address identified CMMI deficiencies; deploy new processes across Organization 1		▬▬▬	▬▬▬	▬▬ ▮▮▮
Train and pilot Personal Software Process / Team Software Process for Organization 2	▬▬	▬▬▬	▬▬▬	▬▬ ▮▮▮
Conduct internal CMMI assessment of Organization 2				▬▮▮▮
Perform SA-CMM / CMMI training and evaluation with Organization 3			▬▬▬	▬
Modify LMS procedures to conform to newly approved NPDs / NPGs		▬▬		
Support Agency Strategies 1-4	▬▬	▬▬▬	▬▬▬	▬▬ ▮▮▮

Figure 6-1. Schedule

7. Funding

For initial planning purposes, the following table shows projected civil service workforce and funding to implement this Plan. The civil service workforce for the SEPG has been approved by the Associate Director for R&T Competencies. Additional civil service FTEs will be provided by the organizations participating in the SPI activities. The LaRC Information Technology (IT) Service Activity funds have been previously approved through the LaRC budget process. Code AE Funds are included in the OCE budget, for which Capital Investment Council approval is pending. These funds will be used only for software process improvement activities, not for software product development. Any changes in the available work force or funding from that shown below is an automatic basis for changing this Plan and the associated schedule.

Table 7-1. Resources for LaRC SPI

FY	CS SEPG FTEs	LaRC IT Service Activity Funds	Code AE Funds
2002	3.0	$184K	$150K
2003	3.0	$184K	$240K
2004	3.0	$129K	$350K
2005	3.0	$129K	$250K
2006	3.0	$129K	$125K

APPENDICES AND ATTACHMENTS

Appendix A. Overview of Capability Maturity Model–Integrated and the Software Acquisition Capability Maturity Model

A.1 Capability Maturity Model–Integrated (CMMI)

NASA has elected to use a CMM-based framework as a guide for SPI and has allowed the use of CMMI as a benchmark for measuring progress on improving organizational capability in software engineering. Either the CMMI or the SA-CMM can be used as benchmarks for improvements in software acquisition. The focus of the CMMI is on management, engineering, and quality assurance for the development and maintenance of products such as software. Performing these tasks plays a critical role in the quality of the products produced. The CMMI outlines five levels of maturity that characterize an organization's capabilities (see figure A-1).

Level	Focus	Process Areas	Result
5 **Optimizing**	*Continuous process improvement*	Organizational Innovation & Deployment Causal Analysis and Resolution	**Productivity & Quality**
4 **Quantitatively Managed**	*Quantitative management*	Organizational Process Performance Quantitative Project Management	
3 **Defined**	*Process standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution	
2 **Managed**	*Basic project management*	Requirements Management Project Planning Project Monitoring & Control Supplier Agreement Management Measurement and Analysis Process & Product Quality Assurance Configuration Management	
1 **Initial**	*Competent people and heroics*		**Risk**

Figure A-1. CMMI Process Areas by level.

In an organization of maturity level 1, success of the organization depends on the competence and heroics of individuals and cannot be repeated unless the same competent and experienced individuals are assigned to the next project;. although these organizations frequently produce products that work, they often greatly exceed the budget and schedule.

In an organization of maturity level 2, the organization has ensured that its processes are planned, documented, performed, monitored, and controlled at the project level; objectives established for the process, such as cost, schedule, and quality objectives are achieved; when these practices are used on similar efforts, similar results are expected; the status of work products and delivery of the services are visible to management at defined points; and work products and services satisfy their specified requirements, standards, and objectives.

At maturity Level 3, the organization's processes are understood and described in standards, procedures, tools and methods; processes are tailored from the organization's set of standard processes and related assets to suit the circumstances in which they will be performed; the organization's set of standard processes are established and improved over time; and an organization level infrastructure to support the current and future use of the organization's set of standard processes is established and improved over time.

At level 4, processes are controlled using statistical and other quantitative techniques; quantitative objectives for product quality, services quality, and process performance are established and used as criteria in managing processes.

At level 5, organizational process performance is continually improved based on an understanding of the common causes of variation inherent in processes; process performance is improved through both incremental and innovative technological improvements; improvements are selected based on a quantitative understanding of their expected contribution; and selected improvements are deployed into the organization systematically.

A.2 Software Acquisition Capability Maturity Model (SA-CMM)

The SEI's SA-CMM is a model for benchmarking and improving the software acquisition process. The model follows a five-level architecture similar to other CMM staged architectures (see figure A-2) but with a unique emphasis on acquisition issues and the needs of individuals and groups who are planning and managing software acquisition efforts.

Level	Focus	Key Process Areas	Result
5 **Optimizing**	*Continuous process improvement*	Acquisition Innovation Management Continuous Process Improvement	**Productivity & Quality**
4 **Quantitative**	*Quantitative management*	Quantitative Acquisition Management Quantitative Process Management	
3 **Defined**	*Process standardization*	Training Program Acquisition Risk Management Contract Performance Management Project Performance Management Process Definition and Maintenance	
2 **Repeatable**	*Basic project management*	Transition to Support Evaluation Contract Tracking and Oversight Project Management Requirements Development & Mgt. Solicitation Software Acquisition Planning	
1 **Initial**	*Competent people and heroics*		**Risk**

Figure A-2. SA-CMM Key Process Areas by level.

Appendix B. Definitions

Capability Maturity Model (CMM): A description of the stages through which software organizations evolve as they define, implement, measure, control, and improve their software processes. This model provides a guide for selecting process improvement strategies by facilitating the determination of current process capabilities and the identification of the issues most critical to software quality and process improvement.[4]

Computer Software Configuration Item (CSCI): An aggregation of software that is designated for configuration management and treated as a single entity in the configuration management process.[5]

IDEAL model: The SEI's Initiating, Diagnosing, Establishing, Acting, and Learning model for implementing process improvement.

Mission-critical software:
    (a) All CSCI's developed, reused, or acquired for inclusion in an NPG 7120.5 project, which fall under one of the two following items:
        1. Flight CSCI's, in which failure of the software could cause mission failure, harm to humans, damage to facilities or equipment, or risk to NASA's public reputation, or
        2. Ground CSCI's[6] designed for use in mission operations in which failure of the software could cause mission failure, harm to humans, damage to facilities or equipment, or risk to NASA's public reputation, or
    (b) Other software development items as designated by the GPMC, the NASA CIO, the NASA OCE, the NASA Office of SMA/NASA Code Q, or by Center SMA office.[7]

Non mission-critical software: All software developed, reused, or acquired for or by NASA except for (a) mission-critical software as defined above, or (b) common desktop COTS software.

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[4] *The Capability Maturity Model: Guidelines for Improving the Software Process*, Software Engineering Institute at Carnegie Mellon University, Addison-Wesley (1994), ISBN 0-201-54664-7.
[5] IEEE Standard 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology.
[6] Ground CSCI's are defined as software products associated with controlling flight hardware and software.
[7] NPG 2820.1, NASA Software Procedures and Guidelines, currently under NODIS review.

Appendix C. Risk Management

A Risk Management Spreadsheet (see template in attachment 1) will be maintained on a continuous basis to identify, analyze, plan, track, control and communicate risks to the LaRC SPI initiative. Responsibility for maintaining the Risk Management Spreadsheet will be assigned by the SEPG. The assigned member will record risks in the Risk Spreadsheet and review them during the monthly SEPG status meeting or whenever necessary. The SEPG will assign a member to analyze each identified risk, to plan and implement mitigating actions on highest priority risks, and to track their progress. The SEPG will take steps to control deviations from mitigation plans.

For each risk in the Risk Management Spreadsheet, the following will be recorded:
- Risk identification number and risk statement (in "condition; consequence format")
- Priority, probability, impact, time frame
- Mitigation strategy and success measures
- Responsible person(s)
- Status, date opened, date updated, date closed

The following definitions of risk attributes will be used:
- Probability
    - High Likelihood of occurrence greater than 70%
    - Medium   Likelihood of occurrence between 40 and 70%
    - Low Likelihood of occurrence less than 40%
- Impact
    - High Schedule delay of more than 4 weeks, or cost overrun of greater than 6%
    - Medium–   Schedule delay of 3 to 4 weeks, or cost overrun of 3 to 6%
    - Low Schedule delay of less than 3 weeks, or cost overrun of less than 3%
- Time Frame (when effect of risk is expected to occur if risk is not mitigated)
    - Near-term   Less than 2 months
    - Mid-term   From 2 to 6 months
    - Far-term   More than 6 months

Appendix D. Overview of the IDEAL Model

The IDEAL[8] model was developed by the SEI at Carnegie Mellon University. This model is a framework that describes the necessary phases, activities, and resources needed for a successful process improvement effort. The five phases of the IDEAL software process improvement cycle are described below.

Initiating phase – The Initiating phase is the starting point of the IDEAL model. The initial improvement infrastructure is established, the roles and responsibilities for the infrastructure are initially defined, and initial resources are assigned. In this phase, an SPI plan is created to guide the organization through the completion of the Initiating, Diagnosing and Establishing phases. Approval for the SPI initiative is obtained along with a commitment of future resources for the job ahead. The general goals of the SPI program are defined. The MSG and SEPG are typically established as key elements for implementing SPI.

Diagnosing phase – The Diagnosing phase lays the groundwork for the later phases. In this phase, the SPI action plan is initiated in accordance with the organization's vision, strategic business plan, lessons learned from past improvement efforts, key business issues, and long-range goals. Appraisal activities are performed to establish a baseline of the organization's current state. The results and recommendations from appraisals and any other baselining activities will be reconciled with existing and/or planned improvement efforts for inclusion into the SPI action plan.

Establishing phase – During the Establishing phase, the issues that the organization has decided to address with its improvement activities are prioritized; strategies for pursuing the solutions are also developed, and the SPI action plan draft is revised accordingly. The general goals from the Initiating phase are refined to create measurable goals that will be included in the final version of the SPI action plan. Metrics necessary to monitor progress are also defined, resources are committed, and training is provided for the TWGs. The action plan developed will guide SPI activity as the TWGs address the prioritized findings and recommendations from the Diagnosing phase. Tactical action plan templates are also created and made available for the TWGs to complete and follow.

Acting Phase – In the Acting phase of the IDEAL model, solutions to address the areas for improvement discovered during the Diagnosing phase are created, piloted, and deployed throughout the organization. Plans are developed to execute pilots to test and evaluate the new or improved processes. After successful piloting of the new processes and determining their readiness for organization-wide adoption, deployment, and institutionalization, plans to accomplish the rollout are developed and executed.

Learning Phase – The objective of the Learning phase is to make the next pass through the IDEAL model more effective. By this time, solutions have been developed, lessons have been learned, and metrics on performance and goal achievement have been collected. These artifacts

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[8]Bob McFeeley: "IDEAL: A User's Guide for Software Process Improvement", Carnegie Mellon University, Software Engineering Institute, Technical Report CMU/SEI-96-HB-001, 1996.

are added to the process database that will become a source of information for personnel involved in the next pass through the model. Using this collected information, an evaluation of the strategy, methods and infrastructure used in the SPI program can be performed. From this evaluation, corrections or adjustments to the strategy, methods, or infrastructure can be made before the start of the next IDEAL cycle.

Some of the questions that should be asked include: Has the infrastructure (MSG, SEPG, TWGs, etc.) performance been appropriate? Have the methods employed by the TWGs in their solution development activities been satisfactory? Have the SPI communication activities been sufficient? Does the sponsorship for SPI need to be reaffirmed? Does another baselining activity need to be performed? The reentry point into the IDEAL model for the next cycle depends on the answers to questions such as these.

Attachment 1. Risk Spreadsheet Template (Excel)

					Risk Spreadsheet						
ID #	Priority	Probability	Impact	Time Frame	Risk Statement (Condition; consequence format)	Assigned To	Mitigation Strategy	Status	Date Opened	Date Updated	Date Closed
1											
2											
3											
4											
5											
6											
7											
8											